

**STUDIES ON THE GENUS *BIDENS* L. (COMPOSITAE) FROM THE EASTERN HEMISPHERE. 3. TYPIFICATION OF NAMES OF *BIDENS*, *COREOPSIS* L., *GUIZOTIA* CASS., AND *MICROLECANE* (SCHULTZ-BIP.) BENTH. & HOOK. F. FROM AFRICA**

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ABSTRACT

Typification is undertaken for names of *Bidens*, *Coreopsis*, *Guizotia* and *Microlecania* considered synonymous with names of native species of African *Bidens*. Lectotypes are chosen for 31 names. Neotypes are selected for three names, viz.: *B. diversa* Sherff, *B. holstii* (O. Hoffm.) Sherff (as *C. holstii* O. Hoffm.) and *B. steppia* (Steetz) Sherff (as *C. steppia* Steetz).

KEY WORDS: *Bidens*, *Coreopsis*, *Guizotia*, *Microlecania*, Compositae, typification, taxonomy, Africa

INTRODUCTION

During the course of revisional studies on the genus *Bidens* in Africa, a large number of problems have arisen concerning typification. Thus, it was decided to undertake a special study to help elucidate these difficulties, which have mainly arisen for the following four reasons.

Firstly, numerous type specimens, formerly housed at B, are apparently no longer extant and presumably were destroyed during World War II. Because of this it has been necessary to undertake a comprehensive search of many herbaria (see acknowledgments for list) in order to try to locate duplicates of these specimens.

Secondly, attempts to typify names published before the full adoption of the "type method" have led to difficulties when a collection, known to consist of two or more duplicates, has been cited in the protologue without reference to herbaria where specimens are housed. The usual practice, often employed by later authors, of adopting as the holotype the specimen of the collection located at the institution where the author of the name worked, or where his "own herbarium" is now housed, is considered unsatisfactory. In particular, this procedure is commonly adopted for names published by Otto Hoffmann in Engler's *Botanische Jahrbücher* and *Die Pflanzenwelt Ost-Afrikas* where the sheets at B are designated as the holotypes by later authors, even though no indication is made in these works that the type material is housed at B, and sheets in other herbaria often bear annotations in Hoffmann's hand. The flawed nature of these assumptions is well illustrated by a second example. Schultz-Bipontinus (1846) described *Bidens schimperi* citing only the collection *G.H.W. Schimper 1429*, of which at least fourteen duplicates housed in nine herbaria are known. Mesfin (1984a) has subsequently designated the sheet of this number at P bearing Schultz-Bipontinus's handwriting as the holotype. Clearly he has assumed that this specimen was the one used by Schultz-Bipontinus in the construction of his protologue. This assumption is probably based on the fact that this is the only sheet of *Schimper 1429* which bears one of Cosson's printed labels indicating that it was formerly in Schultz-Bipontinus's own herbarium which is now housed at P. Mesfin's designation, however, must be rejected on two grounds. First, Schultz-Bipontinus's detailed description contains information that he could not have obtained from this sheet alone; second, other duplicates also possess annotations by Schultz-Bipontinus and were doubtless used by him in the construction of the protologue in conjunction with the specimen at P. For these reasons I consider that there is no holotype of *B. schimperi*.

A more favourable approach to this kind of problem, and that adopted here, is to try to ascertain which of the duplicates, if any, were seen by the publishing author. Most frequently this information may be obtained from annotations, etc., in the publishing author's hand. When it has been established which duplicates were examined then a lectotype should be selected from amongst these. If it is not possible to demonstrate which of the duplicates were seen by the author, then the specimen most closely matching the original description should be selected as the lectotype. In particular, one should avoid automatically choosing the specimen at the author's own herbarium on the grounds that this may be considered a mechanical method of lectotype selection by future workers, and therefore liable to be rejected by invocation of Article 8.1 of the *International Code of Botanical Nomenclature (ICBN)* (Greuter *et al.* 1988). A similar procedure to the above has been adopted in those cases where more than one collection (syntype collections) has been cited by a publishing author.

Thirdly, in his monographs of *Bidens* (Sherff 1937) and *Coreopsis* (Sherff 1936), Sherff usually adopted the procedure of choosing as the lectotype<sup>1</sup> the first cited specimen, or a specimen of the first cited collection, from among the two or more syntypes or syntype collections of previously published names. On the fifteen occasions where he selected lectotypes for names of African *Bidens* and *Coreopsis*, in only one instance did he not follow this procedure. In this case, the selection of a lectotype for *B. stuhlmannii* (O. Hoffm.) Sherff, his reasoning is as follows: "Hoffmann cited a specimen by Meyer first, but this was a mere scrap, utterly worthless for determination. The fairly large and much better specimen by Stuhlmann, though cited after Meyer's, was clearly the type from which Hoffmann's description was drawn." Indeed, elsewhere Sherff states that the reason a particular specimen has been chosen as the lectotype is because it was the "first one cited" (1937:606). Thus I consider that he has selected lectotypes mechanically, and in accordance with Article 8.1 of the *ICBN* these choices may be superseded. Although in many instances his choice of lectotype is satisfactory, in a number of cases better specimens are available and new lectotypes are here selected from among these.

Fourthly, when describing a new species, Sherff occasionally cited more than one specimen of a collection in different herbaria as the type. In these cases I do not consider that he has designated a holotype as defined by Article 7.3 of the *ICBN*, and so a lectotype has been chosen from among the original material. Further to this point, Sherff often adopted an extremely broad concept of a type specimen, usually including within it all sheets of a particular collection in any one herbarium. Clearly this is not the sense in which most contemporary practising taxonomists use this term. The *ICBN* does not expressly provide a definition of a specimen. Article 9.1, however, states that "The type... is a single specimen... except... for small herbaceous plants... [when] the type may consist of more than one individual". From this I interpret that the *ICBN* intends that, except for small herbaceous plants, etc., a type specimen should be one individual, or part thereof. It may, therefore, be argued that in those cases where Sherff's "type specimen" is obviously more than one individual, his act of typification is ineffective. I have, however, adopted the following procedures when dealing with this problem. If the "type material" cited by Sherff was formerly all at B, I consider that it may be taken to have been the holotype, as it is not possible in these circumstances to know if his concept of a specimen corresponds with that of the *ICBN*. The lectotype is then chosen from among the isotypes. If, on the other hand, the "type material" is still extant and is considered to be of more than one individual, the lectotype is chosen from among these specimens (Article 7.5 of the *ICBN*).

Throughout this paper I have attempted to maintain a constant concept

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<sup>1</sup>Sherff did not use the term lectotype in either of these works. I consider, however, that his use of the phrase "type specimen" is, in most instances, "an equivalent" (Article 8.3 of the *ICBN*).

of a type specimen when designating lectotypes and neotypes. Usually this is equivalent to a single herbarium sheet, but occasionally, if a sheet bears specimens that are obviously from different plants, only part of this sheet has been selected as the type.

The entries are arranged alphabetically within each genus. Except where indicated, it is not intended that these names should be considered as referring to accepted species. Indeed, all the names discussed under *Coreopsis*, *Guizotia*, and *Microlecania* are considered by me to be synonymous with species of *Bidens*, as are most of the names included under *Bidens* itself. Subsequent papers in this series will indicate the synonymic position of each of the names discussed.

### *Bidens* L.

*Bidens abyssinica* Schultz-Bip. var. *glabrata* Vatke, Linnaea 39:500. 1875.

TYPE: ETHIOPIA. Scholloda, 24 Sep. 1862, G.H.W. Schimper 285 (LECTOTYPE NOV. [here selected]: Z; Isolectotypes: BM[2 sheets], PRE).

Vatke's original description of *Bidens abyssinica* var. *glabrata* is followed by the citation, in parentheses, of the collection *Schimper 285*. In addition he includes a discussion involving two other *Schimper* numbers (105 and 305), here reproduced in full: "Adest in coll. a. 1854 n. 105. e Gaha Meda prope Dschadscha, a Schweinfurthio Beitr. 142 cum. var. altera (quadriaristata Hochst. fide ejusdem) n. 305 e Gageros confusa, a qua primo intuitu diversissima; nostra transitum praebere videtur ad *B. bipinnatum* L. a Kotschy in Nubia reperit, cui forte stirps abyssinica reducenda." Sherff (1937) selected the three sheets of *Schimper 105* at B as the lectotype. As these are now apparently destroyed, Mesfin (1984a) has chosen the specimen at Z as the new lectotype. It is clear, however, that Vatke had intended that *Schimper 285* should be taken as the type. Throughout this work, when describing new taxa, Vatke consistently cites in parentheses the collection described after the description and before any subsequent notes. Sherff's failure to mention *Schimper 285*, except in a list of specimens examined (1937:402), leads me to believe that he simply did not notice Vatke's citation of this collection. Vatke's discussion shows that he was in fact comparing *Schimper 285* with *Schimper 105*, but it is clear that he did not consider either *Schimper 105* or 305 to be the same taxon as *Schimper 285*. Therefore, by invoking Article 8.1(b) of the ICBN, Sherff's and Mesfin's choice of specimens of the paratype collection *Schimper 105* as lectotype is here rejected in favour of a duplicate of *Schimper 285*. According to Sherff (1937:402) a specimen of *Schimper 285* was formerly housed at B, but in the absence of any indication by Vatke that this, or any other, was the specimen on which his description is based, all the duplicates of this

collection must have equal status and so are here considered cotypes<sup>2</sup>. None of the specimens of this number at BM, PRE, and Z bear Vatke's handwriting, but all are undoubtedly from the same collection and each matches Vatke's brief varietal description. There is no doubt, however, that the best specimen is that at Z. This sheet bears part of a plant with numerous more or less intact leaves, and capitula at various stages of development.

*Bidens bequaertii* De Wild., Repert. Spec. Nov. Regni Veg. 13:204. 1914.

TYPE: ZAIRE. Katanga, Elisabethville, 19 Mar. 1912, *J. Bequaert 270* (LECTOTYPE NOV. [here selected]: BR; Isolectotype: BR).

In his protologue of *Bidens bequaertii*, De Wildemann cited the two collections *Bequaert 270* and *A. Corbisier (H.A. Homblé) 605*. He did not indicate where the specimens that he had studied were housed, but as the only sheets of these numbers to have been located are at BR, where De Wildemann worked, these specimens may be taken to be syntypes. Sherff (1937) selected as the type the two sheets of the first cited collection, *Bequaert 270*. As it has not been possible to ascertain whether these specimens are part of the same individual, this designation must be considered contrary to the definition of a lectotype as employed by Article 7.5 of the *ICBN*, and consequently this choice is here rejected. The specimen chosen as the new lectotype of *B. bequaertii* is that attached to the sheet which has affixed to it De Wildemann's manuscript copy of his original description. This specimen closely matches his description, and was clearly the main element used by him in its construction. It possesses a branched stem bearing many lobed leaves and numerous capitula with mature fruit.

*Bidens crocea* Welw. ex O. Hoffm., Bol. Soc. Brot. 10:177. 1892. TYPE:

ANGOLA. Huilla District, Lake Ivantala, Feb. 1860, *F.M.J. Welwitsch 3964* (LECTOTYPE NOV. [here selected]: BM; Isolectotypes: BM, BR, C, COI, G, K, LISU, M, P).

The two collections *Welwitsch 3964* and *J.M. Antunes [s.n.]*, both collected in the Huilla District of Angola, were cited by Hoffmann for *Bidens crocea*, but without indication of where specimens of these numbers were housed. Sherff (1937) selected the sheet of the former at B as the type, but as this is now apparently destroyed, a new lectotype is required. Interestingly, Sherff did not cite any collections by Antunes for this species, but he did include a specimen of *E. Dekindt 861* from B, now apparently destroyed, also collected in Huilla. A sheet of *B. crocea* at LISC, also possessing the number 861, bears a hand written note indicating that it was collected by either Antunes or Dekindt. It

<sup>2</sup>A cotype is here defined as any duplicate of the type collection when no holotype was designated (see Frizzell 1933).

is possible, therefore, bearing in mind Sherff's meticulous citation of the specimens he studied, that the Dekindt number at B and the specimen at LISC are part of the original material of *B. crocea*. Indeed, the well preserved specimen at LISC closely matches Hoffmann's description. However, the existence of numerous duplicates of the other syntype collection avoids the necessity of choosing this specimen as the new lectotype. The two sheets of *Welwitsch 3964* at BM are of especially high quality. One of these, that which has attached a copy of Welwitsch's manuscript description of *B. crocea*, bears a specimen possessing all the important diagnostic characters of the species and thus is chosen as the new lectotype.

*Bidens diversa* Sherff, Bot. Gaz. 76:159. 1923. TYPE: ANGOLA. Huilla, Lubango, Tundavala, at 12 km, source of the Inhames, 30 Apr. 1971, A. Borges 167 (NEOTYPE [here selected]: LISC; Isonotypes: M,P, PRE,SRGH).

Sherff cited for this species the two sheets of *J.M. Antunes 315*, collected in Mounyino, Angola, in March 1901, both formerly at B and now apparently destroyed. As no duplicates of this collection have been located, a neotype is here selected in accordance with Article 7.4 of the *ICBN*. The sheet of *Borges 167* at LISC is chosen to serve as the neotype because of the close similarity of this specimen to Sherff's original description of *Bidens diversa*. Indeed, all the sheets of this new type collection possess the important diagnostic characters of the fruit and florets which distinguish this species from the closely allied *B. acuticaulis* Sherff.

*Bidens flabellata* O. Hoffm. in Warb., *Kunene-Sambesi Exped.* 419, t. 11G. 1903. TYPE: ANGOLA. at Kuebe near Manonge, 22 Apr. 1900, H. Baum 847 (LECTOTYPE NOV. [here selected]: G; Isolectotypes: BM, BR, K, W).

Hoffmann cited the single collection *Baum 847* for this species, without designating a type specimen. As all the duplicates of this collection bear his handwriting, and clearly were seen by him, it is unlikely that he used only one specimen to describe this taxon. It follows, therefore, that he has not complied with the definition of a holotype as employed by Article 7.3 of the *ICBN*, and in accordance with Article 7.4 a lectotype may be designated. Sherff selected the sheet of this number at B as the type, but as this specimen is now apparently destroyed, a new lectotype is chosen here. The variation shown by *Baum 847* is illustrated by the shape and size of the leaves on the five duplicates seen. Hoffmann described this variation as "foliis...orbicularibus... , praeter basin integerrimam grosse crenatis vel flabellatim multilobatis, segmentis obtusis". The original description, however, is accompanied by a figure which can be seen to possess only the former type of leaf shape. In my choice of lectotype,

therefore, I have paid special attention to this diagram as most closely representing Hoffmann's concept of the species. In this regard I have chosen the specimen at G as the new lectotype due to the close resemblance between this specimen and Hoffmann's figure.

*Bidens kivuensis* Sherff, Bot. Gaz. 96:145. 1934. TYPE: ZAIRE. Mulungu, May 1932, *J. Lebrun 5467* (LECTOTYPE [here selected]: BR; Isolectotypes: BR,F).

In his original description of *Bidens kivuensis*, Sherff cited the type collection, *Lebrun 5467*, as "1st and 2nd type sheets, Herb. Bruss.: 3rd type sheet, Herb. Field Mus." As no holotype was indicated, a lectotype is here selected in accordance with Article 7.4 of the *ICBN*. These three sheets closely match Sherff's original description and were clearly all used in its construction. I have decided to choose the "1st type sheet" as the lectotype, however, because this specimen is in a slightly better state of preservation than those attached to the other two sheets.

*Bidens kotschy* Schultz-Bip. in Walp., *Repert. Bot. Syst.* 6:168. 1846. TYPE: SUDAN. Nubia, Mt. Arasch-Cool, 30 Sep. 1839, *K.G.T. Kotschy 79* (LECTOTYPE [here selected]: P; Isolectotypes: G[4 sheets],K[2 sheets],L,M[2 sheets],MO,S,STU,UPS,W,WAG,WU).

Schultz-Bipontinus' original description of *Bidens kotschy* omits a direct citation of the specimens used by him to describe this species. The protologue does, however, include the sentence "Crescit in Nubia ad stagna pluvialia in radice orientali montis Arasch-Cool et in paludosis Cordofanis", which was clearly obtained by Schultz-Bipontinus from the sheets used by him in its construction. At P are specimens of two widely distributed *Kotschy* collections, numbers 79 and 91, both formerly in Schultz-Bipontinus' own herbarium and which have been determined by him as *B. kotschy*. The printed label on *Kotschy 79* reads "Kotschy iter Nubicum. Ad stagna pluvialia in radice orientali montis Arasch-Cool", while that of *Kotschy 91* reads "Cordofan: in paludosis". No other *Kotschy* collections, at P or elsewhere, possess labels with similar geographic and habitat information. Clearly, therefore, specimens of these two numbers alone were used by Schultz-Bipontinus in the construction of his original description. Indeed, specimens of both these collections closely match this description. Sherff (1937:369) stated that *Kotschy 79* was the type collection of *B. kotschy*, and cited eleven sheets from seven herbaria but without indicating which of these should be taken as the type. I consider this lectotypification to be ineffective because it is contrary to the definition of a lectotype employed by Article 7.5 of the *ICBN*. Mesfin (1984a) has subsequently designated the P specimen of this number as the holotype.

From this act, it is clear that he was unaware of the equal status of the collections *Kotschy 79* and *91*, and on these grounds alone this designation must be considered ineffective. It has been strongly put to me, however, that by one interpretation of Article 8.3 of the *ICBN*, the designation of a specimen as a holotype should be considered an effective lectotypification. Article 8.3 says, "For purposes of priority under Art. 8.1, designation of a type is achieved only if the type is definitely accepted as such by the typifying author, and if the type element is clearly indicated by direct citation including the term 'type' or an equivalent." As Article 8.1 is referring to the designation of lectotypes (and neotypes), the first two usages of the word type in this sentence can be replaced by lectotype (or neotype) without any alteration of meaning. Clearly Mesfin has not "definitely accepted" the P specimen of *Kotschy 79* as the lectotype, and thus this act of typification must be considered ineffective. A new lectotype, therefore, is required for *B. kotschyi*. Both the sheets at P bear single specimens possessing mature capitula and many of the exceedingly distinctive leaves known to me only from these two collections. The specimen of *Kotschy 79*, however, has been selected to serve as the lectotype because of its decidedly superior state of preservation.

*Bidens leptolepis* Sherff, Bot. Gaz., 76:85, t. 9, f. a-g. 1923. TYPE: ZAIRE. Mt. Kundelungu, 10 May 1908, *T. Kassner 2725* (HOLOTYPE: B†; LECTOTYPE [here selected]: Z; Isolectotypes: BM, K, P).

In his protologue of *Bidens leptolepis*, Sherff cited as the type the sheet of *Kassner 2725* at B, now apparently destroyed. Therefore, in accordance with Article 7.4 of the *ICBN*, a lectotype is here selected. There is little to choose between the isotypes at BM, K, P, and Z. The latter specimen has been selected to serve as the lectotype, however, because it possesses a number of well preserved capitula showing the very darkly coloured ray florets which Sherff (1937) considered the key difference in distinguishing between this species and *B. urceolata* De Wild.

*Bidens palustris* Sherff, Bot. Gaz. 76:148. 1923. TYPE: ZAIRE. Kundelungu, 13 Mar. 1908, *T. Kassner 2599* (HOLOTYPE: B†; LECTOTYPE [here selected]: K; Isolectotypes: BM, BR, HBG, P, Z).

Sherff cited the sheet of *Kassner 2599* at B, now apparently destroyed, as the type of *Bidens palustris*. The isotypes, housed at BM, BR, HBG, K, P, and Z, are mostly of fairly poor quality. The specimen at BM, for example, has mostly insect damaged capitula, whilst that at Z has had all its heads removed. By contrast, the specimen on the sheet at K bears two well preserved capitula, one at anthesis and a second possessing many mature fruit, and so is here selected as the lectotype.



*Bidens paupercula* Sherff, Bot. Gaz. 76:158, t. 12, f. a-g. 1923. TYPE: TANZANIA. Kyimbila, 22 Jul. 1912, A.F. Stolz 1442 (HOLOTYPE: B[2 sheets]†; LECTOTYPE [here selected]: M; Isolectotypes: B,C,G,K,L,S, STU,W,WAG[2 sheets],Z[2 sheets]).

In his protologue of *Bidens paupercula*, Sherff cited as the type two sheets of Stolz 1442 at B. A specimen of this number is extant at B, but an attached printed label shows that this sheet was only acquired from the herbarium of Rudolf Gross in 1946, long after Sherff had described *B. paupercula*, and so it is not considered to be part of the holotype. As both of the type sheets are apparently destroyed, a lectotype is here selected in accordance with Article 7.4 of the ICBN. Numerous duplicates of Stolz 1442 are also housed elsewhere. Four of these (at C, G, M, and W) were cited by Sherff, in addition to the type, in his monograph of *Bidens* (1937). It is therefore considered that the lectotype should be chosen from among these specimens which clearly correspond with Sherff's concept of this taxon. These specimens are of variable quality although all match Sherff's original description. The best, however, is that at M which is here selected to serve as the lectotype.

*Bidens praecox* Sherff, Bot. Gaz. 92:450. 1931. TYPE: TANZANIA. Lindi District, Mayanga, 15 May 1903, W.C.O. Busse 2523 (HOLOTYPE: B†; LECTOTYPE [here selected]: EA).

*Bidens rubicundula* Sherff, Amer. J. Bot. 41:762. 1954. TYPE: ZAMBIA. Chizera, 11 Jun. 1953, D.B. Fanshawe F64 (LECTOTYPE [here selected]: K; Isolectotypes: BR,F,K,SRGH).

Sherff cited "two type sheets" at K and an "isotype" at F of Fanshawe F64 for this species. Clearly he considered the specimens at K to constitute the holotype. These two sheets bear a number of specimens, however, and in accordance with Article 7.3 of the ICBN this designation is contrary to the definition of a holotype and must be considered ineffective. A lectotype is thus required and, following Article 7.5, this must be chosen from among the specimens at K. The "1st type sheet" bears parts of perhaps three plants possessing immature and flowering capitula, but lacking mature fruit. The solitary plant on the "2nd type sheet" also bears flowering capitula, but in addition it possesses a number of fruiting capitula bearing extremely mature cypselas. As these and other characters of the mature capitulum are of critical importance in distinguishing between this species and the closely related *Bidens urceolata* De Wild., this sheet is here selected as the lectotype.

*Bidens rupestris* Sherff, Bot. Gaz. 76:144. 1923. TYPE: TANZANIA. Mt. Meru, 27 Nov. 1901, C. Uhlig 750 (HOLOTYPE: B†; LECTOTYPE [here selected]: EA).

*Bidens schlechteri* Sherff, Bot. Gaz. 76:146. 1923. TYPE: SOUTH AFRICA. Transvaal, Houtboschberg, 30 Mar. 1894, *F.R.R. Schlechter 4745* (LECTOTYPE NOV. [here selected]: G; Isolectotypes: C,K).

*Bidens schlechteri* was described by Sherff from two sheets of *Schlechter 4745* formerly at B. He cited these specimens as "type in Herb. Berl., two sheets". Later, however, Sherff (1937) treated one of these sheets as the "type", and the other as the "cotype". Therefore, in the absence of any of this material it is probably best to consider that Sherff did not originally designate a holotype, but later chose a lectotype from between these two sheets. With the loss of these specimens it is necessary to select a new lectotype. Of the three duplicates, none of which were cited by Sherff (1937), those at C and K have well preserved leaves, but only a few badly damaged capitula. The specimen at G, however, although only possessing poor quality foliage, has a number of capitula at various stages of development with characters closely matching those of Sherff's original description. Because the characters of the capitulum were considered by Sherff (1937) to be of great import in distinguishing between this species and the closely related *B. taylorii* (S. Moore) Sherff and *B. kivuensis* Sherff, this specimen is here selected as the new lectotype.

*Bidens setigera* (Schultz-Bip.) Sherff var. *lobata* Sherff, Bot. Gaz. 91:311. 1931. TYPE: Cultivated in garden of J. Veitch and Sons, 1908, from material collected in Kenya by *Capt. Diespecker* (LECTOTYPE [here selected]: K; Isolectotype: K).

Sherff cited the two *Diespecker* sheets at K, labelled "1st" and "2nd" type sheets respectively, for *Bidens setigera* var. *lobata*. As these each bear one specimen, not obviously both from the same individual, it is clear that Sherff has not designated a holotype as defined by Article 7.3 of the *ICBN*, and thus the selection of a lectotype is required. The accompanying description uses only foliar characters, obtained almost exclusively from the "1st" type sheet, to distinguish between this variety and var. *setigera*. In addition, Sherff noted that "The difference in general aspect due to the different amounts of foliar dissection is great, but such a difference... does not appear to justify specific segregation." Therefore, I have decided to choose as the lectotype the "1st" type sheet because this specimen possesses numerous leaves encapsulating the entire range of the varietal description, and is clearly that on which Sherff's concept of this variety is based. The specimen attached to the "2nd" type sheet, by contrast, bears far fewer leaves of decidedly poorer quality.

*Bidens somaliensis* Sherff, Bot. Gaz. 90:395. 1930. TYPE: ETHIOPIA. from Biddum to Volghe, 15 Sep. 1893, *D. Riva & E. Ruspoli 85(1306)* (LECTOTYPE [here selected]: FT; Isolectotype: FT).

Sherff cited for *Bidens somaliensis*, the two sheets of *Riva & Ruspoli 85(1906)* at FT. As it is by no means clear that the specimens attached to these sheets are part of the same individual, and therefore do not correspond with the definition of a holotype as employed by Article 7.3 of the *ICBN*, it is thought desirable to select a lectotype from between them. The specimen on the "1st" sheet is here selected to serve as the lectotype because it bears many capitula at various stages of development, from buds to mature fruiting heads, as well as a number of well preserved leaves, and was clearly the main element used by Sherff in the construction of his description. The other sheet, by contrast, possesses only a few capitula, the most mature of which is just at anthesis.

*Bidens steppia* (Steetz) Sherff var. *leptocarpa* Sherff, Bot. Gaz. 90:392. 1930.

TYPE: TANZANIA. Kyimbila, Kaningwe, 26 May 1911, *A.F. Stolz 729* (HOLOTYPE: B†; LECTOTYPE [here selected]: G; Isolectotypes: B,C,G,K,LE,LU,M,S,STU,W,WAG[2 sheets],Z[2 sheets]).

Sherff cited as the type of this name a sheet of *Stolz 729* at B, now apparently destroyed. The loss of this sheet requires the selection of a lectotype. A specimen of this number is extant at B but, as in the case of *Bidens paupercula* Sherff, this is not considered to be the holotype because it was only acquired from the herbarium of Rudolf Gross in 1946. In his protologue Sherff also cited two "cotypes" (i.e., isotypes) at G. As these sheets are part of the originally designated type material on which the name *B. steppia* var. *leptocarpa* is based, the lectotype must be selected from between them in accordance with Article 7.5 of the *ICBN*. Sherff distinguished the eight varieties of *B. steppia* by employing characters of the cypselas, as well as in addition occasionally using other capitular characters. In the case of var. *leptocarpa*, Sherff (1937) separated this variety from vars. *steppia* and *elskensii* Sherff by the length of the cypselas and outer phyllaries, and from var. *ambacensis* (Hiern) Sherff by the nature of the cypselial aristae. Therefore, because of the importance given to these characters by Sherff in defining his varietal limits, I have decided to choose as the lectotype the specimen possessing the greater number of fruiting capitula and mature cypselas. This is the sheet bearing Stolz's "Flora Africae Oriental." herbarium label. The capitula of this specimen, unlike those on the other sheet, are not insect damaged, and also more closely match Sherff's detailed original description.

*Bidens straminoides* Sherff, Amer. J. Bot. 22:706. 1935. TYPE: RWANDA.

Mt. Bohanga, s.a., *H.F.A. Scaetta 2272* (LECTOTYPE [here selected]: BR; Isolectotype: BR).

Sherff cited the two sheets of *Scaetta 2272* at BR for *Bidens straminoides*. As this collection clearly consists of two specimens, one on each sheet, I do

not consider that he has designated a holotype, as defined by Article 7.3 of the *ICBN*, and thus the selection of a lectotype is necessitated. These specimens are of exceedingly poor quality and should never have been made the type of anything. They possess a few damaged fruiting capitula and withered leaves, and were clearly at a very advanced stage of development at the time of their collection. The specimen on the first sheet, which both Mesfin and Lisowski have determined as *B. grantii* (Oliver) Sherff, possesses parts of three leaves and one capitulum completely lacking fruit. Fortunately, the specimen on the second sheet, apart from bearing a number of leaves, possesses two complete capitula with numerous mature cypselas. This sheet is thus reluctantly selected to serve as the lectotype.

### *Coreopsis* L.

*Coreopsis abyssinica* Schultz-Bip. var. *bipinnato-partita* Chiov., *Annuario Reale Ist. Bot. Roma* 8:185. 1904. TYPE: ETHIOPIA. Eritrea, Ghinda, Donkollo, 14 May 1892, G.A. Schweinfurth & D. Riva 2119 (LECTO-TYPE [here selected]: FT; Isolectotypes: G,K,P,Z).

Chiovenda cited seventeen collections under his brief description of this variety. With the exception of *Schweinfurth & Riva 2119* and *A. Pappi 4101*, all are unicate specimens housed at FT. Duplicates of *Schweinfurth & Riva 2119* are located at FT, G, K, P, and Z, while sheets of *Pappi 4101* are at FT and RO. Mesfin (1984a) transferred this variety to the rank of subspecies under *Bidens setigera* (Schultz-Bip.) Sherff. Within this new taxon he included four of Chiovenda's syntype collections, namely *A. Terracciano & Pappi 1165*, *G. Scotti s.n.*, *Pappi 4101*, and *Schweinfurth & Riva 2119*, the others being included in either *B. setigera* ssp. *setigera* or *B. camporum* (Hutch.) Mesfin. He claimed that *Schweinfurth & Riva 2119* was the "original collection", and designated the specimen of this number at FT as the holotype. This claim, however, cannot be substantiated by an analysis of Chiovenda's protologue which shows that all the collections are given equal status. Indeed, an examination of the original material shows that Chiovenda saw all the specimens at FT as well as the sheet of *Pappi 4101* at RO. Therefore Mesfin's first claim must be rejected. His designation of the FT sheet of *Schweinfurth & Riva 2119* as the holotype is, of course, also incorrect. It is possible, however, that this designation can be considered an effective lectotypification by reference to Article 8.3 of the *ICBN*. I refer the reader to the discussion under *B. kotschyi* Schultz-Bip. for an explanation of why I consider this unacceptable. In an attempt to maintain current usage of the name *C. abyssinica* var. *bipinnato-partita* (Rec. 7B.5 of the *ICBN*), I have decided to choose as the lectotype a specimen of one of the four collections included by Mesfin in *B. setigera* ssp. *bipinnato-partita* (Chiov.) Mesfin. All the specimens in question

match Chiovenda's description, but because of the existence of the duplicates of *Schweinfurth & Riva 2119*, I have selected the specimen of this collection at FT as the lectotype.

*Coreopsis badia* Sherff, Bot. Gaz. 76:90. 1923. TYPE: TOGO. 1908-09, *G. de Gironcourt 256* (HOLOTYPE: B†; LECTOTYPE [here selected]: P).

*Coreopsis baumii* O. Hoffm. in Warb., *Kunene-Sambesi Exped.* 419. 1903. TYPE: ANGOLA. Mambunda region, between Kuma and Kutsi, *H. Baum 883* (LECTOTYPE NOV. [here selected]: W; Isolectotypes: BM, COI,G,K,M).

Hoffmann cited for *Coreopsis baumii*, the collection *Baum 883*, without designating a specimen as the type. As all the extant duplicates of this collection possess his handwriting and clearly were seen by him before their distribution from B, it is unlikely that he used only one specimen to describe this taxon. It follows, therefore, that he has not complied with the definition of a holotype as employed by Article 7.3 of the *ICBN*, and in accordance with Article 7.4 a lectotype may be selected. The sheet of this number at B was designated the "type" by Sherff (1937), but as this specimen is now apparently destroyed, a new lectotype is required. There is little to choose between those duplicates that I have seen. The sheet at W, however, is here selected as the new lectotype because it most closely matches Hoffmann's protologue. This specimen possesses a solitary branched stem with many leaves in good condition, four mature capitula, and the most mature fruits of any of the six cotypes.

*Coreopsis crataegifolia* O. Hoffm., Bot. Jahrb. Syst. 30:431. 1901. TYPE: TANZANIA. Livingstone Mts., Yawulanda Mt., 18 Apr. 1899, *W. Goetze 851* (LECTOTYPE NOV. [here selected]: BM; Isolectotype: BR).

In his protologue of *Coreopsis crataegifolia*, Hoffmann cited the collection *Goetze 851*, without indicating which specimen was intended to be taken as the type. Both of the extant duplicates at BM and BR bear his handwriting, and so clearly were seen by him before their distribution from B. Therefore, as it is most likely that these sheets were used in the construction of the description, it is apparent that Hoffmann has not complied with the definition of a holotype as employed by Article 7.3 of the *ICBN*, and in accordance with Article 7.4 a lectotype may be designated. Sherff (1937) cited the sheet at B as the type. This specimen is now apparently destroyed and consequently a new lectotype is required. At least two duplicates are in existence, one each at BM and BR. Both are clearly Hoffmann's taxon, but the former is chosen as the new lectotype because it possesses two branches, each with well preserved leaves and flowering capitula. The BR specimen, on the other hand, is a solitary broken branch with one damaged capitulum and many senescent leaves.

*Coreopsis exaristata* O. Hoffm. in Engl., *Pflanzenw. Ost-Afrikas*, C:414. 1895.

TYPE: TANZANIA. Usambara, s.a., C.H.E.W. Holst 5002 (LECTOTYPE NOV. [here selected]: WU; Isolectotype: B).

Hoffmann cited the three *Holst* nos. 102, 207, and 5002 for *Coreopsis exaristata*, without reference to where specimens of these numbers were housed. Therefore, these three collections are here treated as forming a syntype collection consisting of all the duplicate specimens. Sherff (1937) mechanically selected a sheet of the first cited collection as the type, i.e., no. 102 at B, and this choice is rejected in accordance with Article 8.1 of the *ICBN*. No duplicates of *Holst* 102 have been located, but a sheet of no. 207 is at BM, whilst specimens of no. 5002 are at B and WU. None of these sheets bears any indication that they were seen by Hoffmann. The specimen of *Holst* 207 is a mere scrap and wholly unworthy of lectotypification. The sheets of *Holst* 5002, on the other hand, bear large leafy specimens closely resembling Hoffmann's original description. The specimen at WU is selected as the new lectotype,

*Coreopsis holstii* O. Hoffm. in Engl., *Pflanzenw. Ost-Afrikas*, C:415. 1895.

TYPE: TANZANIA. T3, Tanga Region, Lushoto Distr., West Usambara Mts., Shagayu F. R., summit 2.5 km ENE of Shagayu Sawmill, 14 Mar. 1984, A. Borhidi, Sebsebe Demissew, M. Hedrén, S.T. Iversen, W.R. Mziray, & T. Pócs 84879 (NEOTYPE [here selected]: MO; Isoneotypes: ETH n.v.,K,UPS).

Hoffmann cited for *Coreopsis holstii* the collection C.H.E.W. *Holst* 76, collected in the Usambara region of Tanzania in October 1891, again without reference to where specimens were housed. According to Sherff (1923) a sheet of this collection bearing three flowering specimens was at B. Unfortunately, this sheet is now apparently destroyed and no duplicates of this collection have been located. As I consider this taxon to be a good species, as *Bidens holstii* (O. Hoffm.) Sherff, a neotype is here selected in accordance with Article 7.4 of the *ICBN*. A small number of specimens of this species have been collected from the type locality. One of these, here selected as the neotype, is the MO specimen of *Borhidi et al.* 84879. This specimen, the best of all the duplicates of this collection, closely matches Hoffmann's original description of this species and Sherff's figure (1937) drawn from the type specimen. It possesses numerous capitula at anthesis and in fruit, as well as many of the exceedingly characteristic leaves.

*Coreopsis kilimandscharica* O. Hoffm., Bot. Jahrb. Syst. 20:234. 1894. TYPE:

TANZANIA. Kilimanjaro, Uschiri, 14 Jun. 1893, G.L.A. Volkens 398 (LECTOTYPE NOV. [here selected]: BM; Isolectotype: G).

Hoffmann cited for *Coreopsis kilimandscharica*, the three collections *W.L. Abbott s.n.* and *Volkens 398* and *537*, without reference to where specimens of these numbers were housed. Sherff (1937) selected the specimen of *Abbott s.n.* at B as the type because this "was the first one cited by Hoffmann." Again this is a mechanical method of lectotype selection and, by invoking Article 8.1 of the *ICBN*, this choice is here rejected. Specimens of all three collections were formerly at B (Sherff, 1937), but these are now apparently destroyed. Fortunately, at least one duplicate of each collection is extant elsewhere. The only sheet of *Abbott s.n.* is at US. This is a particularly poor specimen, hence the rejection of Sherff's choice of lectotype. The best specimens of the syntype collection are the sheets of *Volkens 398* at BM and G. These closely match Hoffmann's original description of this taxon. The BM specimen is chosen as the new lectotype, however, because of the superior quality of its flowering capitula.

*Coreopsis leptoglossa* Sherff, Bot. Gaz. 76:88. 1923. TYPE: ZAIRE. Lofuku River, 25 May 1908, *T. Kassner 2871* (HOLOTYPE: B†; LECTOTYPE [here selected]: Z[p.p.min.]; excl. Isolectotypes: BM, K, P, Z[p.p.maj.]).

Sherff cited for *Coreopsis leptoglossa*, the sheet of *Kassner 2871* at B. As this is now apparently destroyed, a lectotype is here designated in accordance with Article 7.4 of the *ICBN*. According to Sherff's original description this plant possessed "Folia... bipinnata, segmentis linearibus, plerumque circ. 1 mm., rarius 1.5-2 mm. latis... Involucri bracteae basi dense aliter leviter hispidae... interioribus lanceolatis". An examination of the isotypes at BM, K, P, and Z clearly shows that this number is a mixed collection. Of all the duplicates seen only one of the two specimens on the sheet at Z fits this description. The other specimens have entire to deeply lobed or pinnatisect leaves with segments rarely less than 5 mm wide, outer phyllaries mostly densely hispid throughout, and inner phyllaries more or less oblong. Therefore, the right hand specimen on the sheet at Z, although a rather poor specimen with only one immature head, is here selected as the lectotype.

*Coreopsis lineata* Klatt, Ann. K. K. Naturhist. Hofmus. 7:103. 1892. TYPE: ANGOLA. Pungo-Andongo, Jan.-Apr. 1879, *A. von Mechow 131* (LECTOTYPE [here selected]: Z; Isolectotype: GH).

Klatt cited the collection *Mechow 131* for *Coreopsis lineata*, without designating a specimen as the type. It is by no means clear which of the duplicates were used by Klatt in the construction of his protologue. As both the duplicates at GH and Z bear annotations in his hand, however, it is apparent that they were seen by him, and were probably used, at least in part, to describe this taxon. Therefore, Klatt cannot be considered to have complied with the definition of a holotype as provided by Article 7.3 of the *ICBN*, and

in accordance with Article 7.4, a lectotype is here selected. Sherff (1937:600) cited sheets at B and GH for this name, but did not designate either of these as the type. As the sheet at B is now apparently destroyed, the lectotype is here chosen from between the specimens at GH and Z. The latter specimen is here selected as the lectotype because it possesses two flowering capitula with many fairly mature fruit, and a number of leaves which closely match Klatt's original description. The specimen at GH, on the other hand, has only one capitulum at anthesis, and a few damaged leaves.

*Coreopsis lupulina* O. Hoffm., Bot. Jahrb. Syst. 30:432. 1901. TYPE: TANZANIA. Usafua, Beya Mts., 27 Jun. 1899, W. Goetze 1069 (LECTOTYPE NOV. [here selected]: P; Isolectotypes: BM, BR, K, L).

Hoffmann cited for *Coreopsis lupulina*, the collection *Goetze 1069*, without designating a specimen as the type. As all the extant duplicates of this collection possess his handwriting and clearly were seen by him before their distribution from B, it is unlikely that he used only one specimen to describe this taxon. It follows, therefore, that he has not complied with the definition of a holotype as employed by Article 7.3 of the *ICBN*, and in accordance with Article 7.4 a lectotype may be selected. Sherff (1936) cited as the "type specimen" the two sheets of this number at B. As these are now both apparently destroyed a new lectotype is required. Duplicates of *Goetze 1069* are extant at BM, BR, K, L, and P. Of these, the sheet at P is here selected to serve as the new lectotype. The specimen on this sheet is the apex of a branch possessing many mature leaves and nine capitula at various stages of development, and shows all the important diagnostic characters attributed to this taxon by Hoffmann.

*Coreopsis ochracea* O. Hoffm., Bot. Jahrb. Syst. 30:431. 1901. TYPE: TANZANIA. Uhehe, Bweni, 11 Mar. 1899, W. Goetze 731 (LECTOTYPE NOV. [here selected]: BM).

Hoffmann based this name on the collection *Goetze 731*, but failed to designate a specimen as the type. The only extant duplicate, at BM, bears Hoffmann's handwriting, and thus clearly was seen by him before its distribution from B. Sherff (1925) designated a sheet of this number at B as the type. It is likely that both this specimen and the one at BM were used by Hoffmann in the construction of his description. Therefore it follows that Hoffmann has not complied with the definition of a holotype as employed by Article 7.3 of the *ICBN*, and in accordance with Article 7.4 a lectotype may be designated. The apparent loss of the sheet at B requires the selection of the specimen at BM as the new lectotype.



*Coreopsis pinnatipartita* O. Hoffm., Bot. Jahrb. Syst. 30:432. 1901. TYPE: TANZANIA. Usafua, Poroto Mt., 17 Jun. 1899, W. Goetze 1041 (LECTOTYPE NOV. [here selected]: P; Isolectotypes: BM,K,L,Z).

Hoffmann cited the two collections, *Goetze 1041* and *J. Buchanan 380*, in his protologue of *Coreopsis pinnatipartita*. The former was cited in large print immediately following the Latin and German descriptions. The latter, however, was cited in a smaller type face in some notes at the end of the protologue. The first sentence of this reads: "Ein von Buchanan im Jahre 1891 im Nyassaland gesammeltes Exemplar (n. 380) gehört offenbar zu derselben Art." This is followed by a perfunctory description in German. This evidence alone would suggest that Hoffmann based his concept of *C. pinnatipartita* on the collection *Goetze 1041*, and that *Buchanan 380* was considered by him to be just another example of this species. In addition, examination of the duplicates of both collections clearly shows that the species description was based solely on the specimens of *Goetze 1041*. For this reason I consider that *Goetze 1041* should be taken as the type collection, with *Buchanan 380* treated as a paratype collection. No indication was made by Hoffmann as to where specimens of *Goetze 1041* were housed. As all the duplicates at BM, K, L, P, and Z bear his handwriting, and were clearly, therefore, seen by him before their distribution from B, it is unlikely that only one specimen was used by him to describe this taxon. It follows, therefore, that he has not complied with the definition of a holotype as employed by Article 7.3 of the *ICBN*, and in accordance with Article 7.4 a lectotype may be selected. Sherff (1936) cited the two sheets of *Goetze 1041* at B as the type, but as these are both now apparently destroyed a new lectotype is required. Wild (1967) selected the K sheet of the paratype collection *Buchanan 380* as the neotype. This choice is rejected, however, because the existence of duplicates of *Goetze 1041* deem this selection ineffective (Article 8.1[a] of the *ICBN*). The sheet at P is here selected to serve as the new lectotype because of the high quality of its leaves and capitula, some of which bear fairly mature fruit.

*Coreopsis scabrifolia* Sherff, Bot. Gaz. 76:86. 1923. TYPE: ZAIRE. Kundelungu, 15 May 1908, T. Kassner 2776 (HOLOTYPE: B†; LECTOTYPE [here selected]: BM; Isolectotypes: BM,K,P,Z).

When Sherff described *Coreopsis scabrifolia* from the collection *Kassner 2776*, in addition to the holotype at B, he cited "two co-type sheets" at BM. As the B sheet of this number is now apparently destroyed, I have selected as the lectotype one of these two sheets in accordance with Article 7.5 of the *ICBN*. The sheet chosen is that bearing Kassner's collecting label. This specimen possesses many capitula at various stages of development, and shows more clearly than any of the other duplicates the dimorphic leaf shape exhibited by this collection and described by Sherff.

*Coreopsis steppia* Steetz in Peters, *Naturw. Reise Mossambique* 6:496. 1864.  
 TYPE: MOZAMBIQUE. Mocuba, Lugela District, Namagra, 1946-7, H.G. Faulkner Kew 10 (NEOTYPE [here selected]: K; Isonotypes: BM, BR, COI, EA, FT, G(2 sheets), K(2 sheets), P, PRE, S, SRGH).

Steetz cited for *Coreopsis steppia* the solitary specimen, mounted on two sheets, of *W.C.H. Peters* 57 at B, collected from Rios de Sena, Mozambique, between 1842 and 1848. Because I consider *C. steppia* to be a good species, as *Bidens steppia* (Steetz) Sherff, the apparent loss of the Peters specimen necessitates the selection of a neotype in accordance with Article 7.4 of the *ICBN*. In choosing a neotype I have attempted to find a collection from near the type locality, which closely matches Steetz's long and detailed diagnosis and description, and which is also well distributed throughout many of the world's major herbaria. A collection which amply fulfills these requirements is *Faulkner Kew 10*. Many of the specimens of this number would make perfectly serviceable neotypes. One of the best, however, is that at K labelled "Sheet 1", which is here selected. This plant possesses most of the characters used by Steetz in his original description, including the diagnostically important characters of the mature fruit.

#### *Guizotia* Cass.

*Guizotia bidentoides* Oliver & Hiern in Oliver, *Fl. Trop. Afr.* 3:386. 1877.  
 TYPE: MALAWI. 3 miles from river Shire, Aug.-Sep. 1861, C.J. Meller s.n. (LECTOTYPE [here selected]: K).

*Guizotia bidentoides* was described by Oliver & Hiern from a sheet at K cited in their protologue as "Manganja Hills, 500-3,000 ft. alt., Kirk!". The sheet in question, however, bears three separate gatherings. The first, collected by Meller, bears a printed "Livingstone's Zambesi Expedition" label saying "About Lat. 16 South, Long. 35E. Aug. & Sept. 1861", with the additional hand written note "From a hill 500ft - 3 miles from river Shire". The second, also collected by Meller, bears the printed label "Manganja Hills. Sept. to Nov. 1861". The third has attached a hand written note by J. Kirk saying "Karizakwwo, Entr. to Bangu Pass 3000ft." Clearly, therefore, it can be seen that all three collections were used to construct the protologue. The Kirk specimen cannot be considered to be the holotype because, by the definition employed in Article 7.3 of the *ICBN*, the holotype is "the one specimen... used by the author or designated by him as the nomenclatural type." It is clear from the above that Oliver & Hiern attributed the whole sheet to Kirk, instead of just the small part actually collected by him. Thus, Oliver & Hiern cannot be considered to have designated *one* specimen as the holotype, and hence the need for the selection of a lectotype. It is also clear that all three plants were

used in the construction of the description. Oliver's notes on the sheet refer mostly to the Kirk specimen and Meller specimen from the Manganja Hills. Unfortunately, both these collections are badly damaged. The measurement of leaf size in the published description, however, is clearly taken from the other Meller collection which is here selected as the lectotype. This specimen, which corresponds closely with Oliver & Hiern's original description, is the apical portion of a branch bearing a number of well preserved leaves and capitula.

*Microlecan* (Schultz-Bip.) Benth. & Hook. f.

*Microlecan carinata* Hutch., Bull. Misc. Inform. Kew 1916:41. 1916. TYPE: ETHIOPIA. Gondar and vicinity, s.a., R.E. Massey 74 (LECTOTYPE [here selected]: K).

Hutchinson published his description of *Microlecan carinata* in 1916 citing the three syntypes Massey 74, G.H.W. Schimper 1386, and J.A. Grant s.n. There are sheets of all these numbers at K bearing Hutchinson's handwriting. Previously, Hoffmann (1906) had cited the collections Schimper 1386 and F.G. Rohlf's & A. Stecker s.n. for his *Coreopsis schimper*. Mesfin (1984b) has subsequently claimed that because of the inclusion of "type material of another 'name', *M. carinata* Hutch. is an illegitimate name according to article 63 of the International Code of Botanical Nomenclature." However, Article 63.1 clearly states that in order for a name to be illegitimate it must include "all syntypes" of another name, instead of, as in this case, only one specimen of the syntype collection. Thus it can be seen that *M. carinata* is a legitimate name. The three syntypes of this name are well preserved specimens, possessing capitula with mature fruit, and were apparently used fairly equally by Hutchinson in the construction of his diagnosis and description. The selection of the lectotype, however, has been determined by factors governed by articles of the ICBN. The specimen of Schimper 1386 at K has been designated the new lectotype of *C. schimper* O. Hoffm. by Mesfin (1984a), and so is excluded from selection by Article 63.1. The specimen of Grant s.n. has been included in *B. negriana* (Sherff) Cuf. by Mesfin (1984a), and so in order to preserve the current usage of the name *M. carinata* is not here considered a candidate for lectotypification (Rec. 7B.5). Thus the only specimen available for selection as the lectotype is Massey 74, which is here chosen.

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